

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC**

In the Matter of	)	
	)	
RADWIN LTD.	)	RM-11812
	)	
Amendment of Part 15 of the Commission's	)	
Rules To Advance Improved Broadband	)	
Services in the U-NII-1 and U-NII-3 Bands	)	

**COMMENTS OF FACEBOOK, INC.**

**I. INTRODUCTION.**

Facebook supports industry efforts to promote more flexible and intensive use of unlicensed spectrum. RADWIN's proposal to permit devices in the 5.15-5.25 GHz and 5.725-5.85 GHz bands ("5 GHz Band") that sequentially emit directional beams represents a promising step in that direction.<sup>1</sup> In particular, allowing steerable, active phased-array antennas in outdoor settings at the higher power levels applicable to point-to-point links will result in the more intensive use of the 5 GHz Band, eliminate unnecessary siting costs, and unlock new 5G deployment scenarios. These technologies can help meet the growing need for unlicensed spectrum by encouraging more spectrally efficient use of the 5 GHz Band.

While Facebook finds much to commend in RADWIN's Petition, any reforms to the 5 GHz Band must preserve the fundamental character of unlicensed spectrum by continuing to allow non-rivalrous deployments. By promptly initiating a Notice of Proposed Rulemaking ("NPRM"), evaluating the technical merits of RADWIN's Petition, and assessing the need for additional interference-mitigation criteria, the Commission can help meet the twin goals of maximizing efficient deployments in the 5 GHz Band while preserving coexistence.

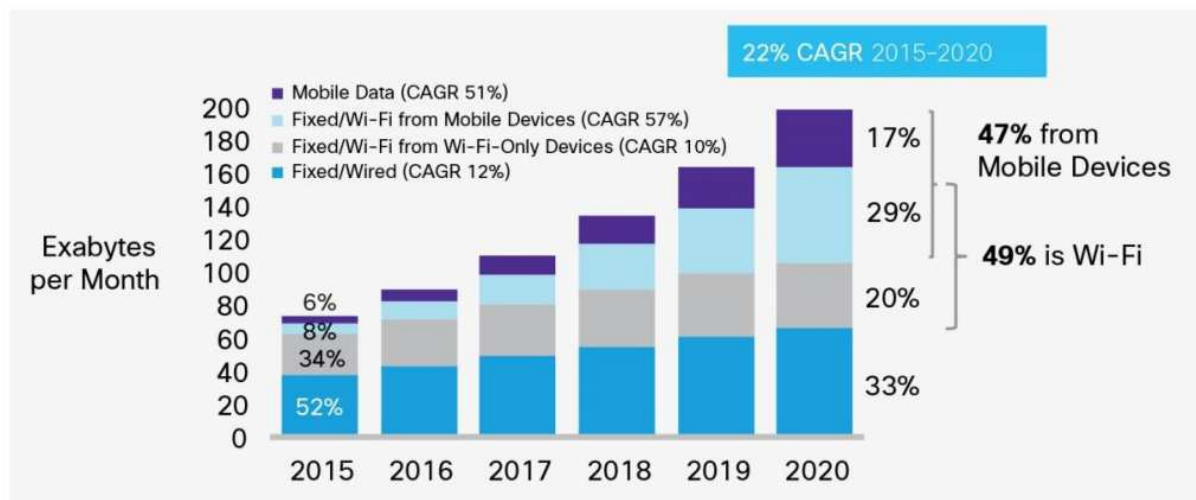
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<sup>1</sup> See Petition for Rulemaking of RADWIN LTD., RM-11812 (filed June 29, 2018) ("Petition").

## II. ALLOWING MORE EFFICIENT USE OF THE 5 GHZ BAND WILL STIMULATE ECONOMIC GROWTH, REDUCE CONGESTION, LOWER BARRIERS TO ENTRY, AND HELP KEEP PACE WITH THE SPIKE IN TRAFFIC.

### A. The Commission Must Act to Ensure that Unlicensed Bands Can Sustainably Support the Coming Explosion in Traffic.

The United States faces a growing need to use unlicensed spectrum more efficiently and intensively for next-generation broadband deployments. Only 540 megahertz of channelized unlicensed spectrum—the 2.4 GHz and 5 GHz bands—is currently available for wireless broadband use. Yet these unlicensed bands carry more internet traffic than any other wireless technology or service.<sup>2</sup> Analysts predict a shortfall of more than 500 megahertz of unlicensed spectrum by 2025,<sup>3</sup> and Cisco projects an explosion of traffic over the 2.4 GHz and 5 GHz bands in the near future.<sup>4</sup>



<sup>2</sup> Cisco, *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update*, 2016– 2021, at 21–22 & fig. 23 (2017) (“*Cisco Visual Networking Index*”), <https://bit.ly/2eYzmpm>.

<sup>3</sup> Steve Methley & William Webb, Quotient Assocs. Ltd., *Wi-Fi Spectrum Needs Study*, at 29 (Feb. 2017) (“[B]etween 500 MHz and 1 GHz of new spectrum will be needed in 2025 to satisfy the anticipated busy hour.”), <https://bit.ly/2NSC7YL>.

<sup>4</sup> *Cisco Visual Networking Index*, at Fig. 23.

The marked growth of fixed-wireless represents a key driver of the need to support more traffic over unlicensed spectrum. While unlicensed spectrum is typically associated with indoor mobile broadband uses like Wi-Fi, high-power, outdoor point-to-point deployments in the unlicensed bands are becoming increasingly critical to support 5G applications. One study forecasts that the nationwide number of fixed-wireless subscribers—many of which use unlicensed spectrum—will nearly double from more than 4 million at the end of 2016 to 8 million by 2021, with core industry revenues nearly doubling from \$2.3 billion to more than \$5.2 billion.<sup>5</sup> Investment in unlicensed fixed wireless, meanwhile, continues to increase for enterprise deployment uses, too.

The growth of fixed-wireless traffic over unlicensed bands is hardly surprising. Unlicensed spectrum offers low barriers to entry, which promote innovation and experimentation by new entrants that lack the economies of scale or the financial resources to justify investments in licensed bands. Larger mobile broadband operators, too, use the unlicensed bands to offload fixed-wireless traffic or complement licensed deployments. Moreover, given the dearth of licensed mid-band spectrum, the 2.4 GHz and 5 GHz bands are among the few available bands with the propagation characteristics that promise the coverage and capacity to support the Internet of Things and ultra-low latency fixed-wireless applications. As the GSMA has noted, “[f]uture networks will rely on a combination of mainstream and alternative technologies, and use both licensed and unlicensed spectrum, across different spectrum bands.”<sup>6</sup> But GSMA also

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<sup>5</sup> Carmel Group, *Ready for Takeoff: Broadband Wireless Access Providers Prepare to Soar with Fixed Wireless* (2017), <https://bit.ly/2LSF6zy>.

<sup>6</sup> Emeka Obiodu & Mark Giles, *The 5G Era: Age of Boundless Connectivity and Intelligent Automation*, GSM Association, at 10 (2017), <https://bit.ly/2An5nF2>.

warns that “[s]pectrum will remain a critical but scarce resource in the 5G era. This applies to both the licensed and unlicensed bands that will play a key role in delivering the 5G era vision.”<sup>7</sup>

The Commission has two sets of policy tools to meet the increased demand for unlicensed spectrum. First, the Commission can repurpose other fallow bands for unlicensed use. But this approach has limitations because efforts to identify new bands suitable for unlicensed use are unlikely to bear fruit in the immediate future. In some circumstances, the Commission does not successfully find candidate bands. In late 2016, for example, based on consultations with the National Telecommunications and Information Administration (“NTIA”), the Commission announced that it would terminate its effort to open the U-NII-2B band to unlicensed technologies. As a result, 160 megahertz of spectrum has remained entirely unavailable to consumers.<sup>8</sup> And even though the Commission is currently exploring the possibility of allowing unlicensed use in the 6 GHz band, it has yet to issue an NPRM. While Facebook supports the Commission’s plan to release an NPRM for the 6 GHz Band, the Commission need not wait for the conclusion of that proceeding to implement rules that more immediately address the growing demand for unlicensed spectrum.

Fortunately, the Commission has another tool available—it can update its Part 15 service rules to allow for more flexible and intensive deployments in bands currently allocated for unlicensed use. As discussed below, RADWIN’s Petition to allow for sequentially-emitted directional beams outdoors in the 5 GHz Band at the higher power limits applicable to point-to-point antennas represents another timely opportunity for the Commission to modernize the Part

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<sup>7</sup> *Id.* at 13.

<sup>8</sup> See *The Commission Seeks to Update and Refresh the Record in the “Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band” Proceeding*, Public Notice, 31 FCC Rcd. 6130, 6131–32 (2016) (noting that the U-NII-2B range would be addressed in a future phase of the proceeding, which has not occurred).

15 rules and streamline outdated technical restrictions that impair maximally efficient use of the unlicensed bands.

**B. Allowing Steerable, Active-Phased Antennas in the 5 GHz Band Can Help Satisfy Demand in the Unlicensed Bands By Promoting Spectrally Efficient Use.**

RADWIN’s proposal to allow steerable, phased-array antennas—also known as “smart antennas”—in the 5 GHz Band promises to meet growing demand to support fixed-wireless traffic by more efficiently using unlicensed spectrum while minimizing the risk of interference to existing users.

Smart antennas use a group of radiating elements arranged and driven in such a way that their radiated fields add in some directions and cancel in others. The result is beamforming—the transmission of highly directional signals to multiple, spatially-separated subscribers from a single base station while minimizing radiation in unused areas. Because these antennas are used outdoors, they typically do not interfere with indoor uses of unlicensed spectrum, such as in-building Wi-Fi. The transmission to each subscriber occurs sequentially, and the angle of the transmission beam adjusts electronically to establish a more direct line-of-sight path with each receive-antenna. Smart antennas therefore bear little resemblance to traditional point-to-multipoint systems, which transmit to multiple receive-antennas by radiating a widebeam, sectorized signal indiscriminately into a large area. Rather, a single smart antenna is technically indistinguishable from multiple point-to-point links.

The Commission correctly recognized that technical reality when it allowed phased-array antenna systems in the 2.4 GHz band. The Commission noted that phased-array antennas would benefit service providers in both rural and high-density areas. For rural communities, smart antennas would “allow service providers to use higher powers to reach distant customers” under

the EIRP limits for point-to-point antennas.<sup>9</sup> In urban areas, by contrast, the Commission observed that “new antenna systems will allow providers to re-use spectrum more efficiently and thereby serve multiple clients with minimal interference risk.”<sup>10</sup> Despite these benefits, the Commission has yet to address the use of phased-array antennas in the 5 GHz Band.

The benefits of allowing smart-antenna technology, as RADWIN notes, are equally salient in the 5 GHz Band as they are in the 2.4 GHz Band. In particular, permitting steerable, phased-array antennas in the 5 GHz Band would have the salutary effect of reducing barriers to entry—especially in rural areas. By allowing transmission to multiple endpoints using a single piece of equipment, smart antennas reduce the need for transmit-antenna deployment. Smart antennas also minimize providers’ transmit-antenna footprint because higher power limits and highly focused directional beams allow the signal to travel farther in distance. Rationalizing transmit-antenna deployment means significant cost savings in rural areas, where the economics of serving a sparsely populated set of subscribers are difficult enough. In addition to incentivizing rural deployment, smart antennas help reduce interference and congestion: the noise created from many transmit-antennas at lower power levels would exceed the noise of fewer transmit-antennas that operate at higher power levels.

Overregulation of the 5 GHz Band frustrates the goal of achieving the gigabit speeds that consumers want and expect over unlicensed spectrum. The 2.4 GHz band is becoming more saturated<sup>11</sup> as demand increases, which means there is a growing need to intensively and efficiently use the 5 GHz Band. But further deployment in the 5 GHz Band will not occur—

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<sup>9</sup> *Modification of Parts 2 and 15 of the Commission’s Rules From Licensed Devices and Equipment Approval*, Report and Order, 19 FCC Rcd 13539 ¶ 17 (2004)

<sup>10</sup> *Id.*

<sup>11</sup> See Cisco, *Enterprise Best Practices for iOS Devices on Cisco Wireless LAN*, at 48 (2018), <https://bit.ly/2s2xi8T>.

especially in rural areas—if the Commission’s Part 15 rules impose financially impracticable requirements to build more transmit-antennas than necessary. Eliminating outdated regulations that restrict the efficient use of the 5 GHz Band will stimulate investment and generate more unlicensed capacity.

### **III. PROMPTLY INITIATING A RULEMAKING ON RADWIN’S PETITION WOULD HELP ENCOURAGE THE PROVISION OF NEW TECHNOLOGIES AND SERVICES TO THE PUBLIC.**

Section 7 of the Communications Act requires that the Commission “determine whether any new technology or service proposed in a petition or application is in the public interest within one year after such petition or application is filed.”<sup>12</sup> The Commission has recently recognized that “Section 7 reflects clear Congressional intent to encourage and expedite provision of technological innovation that would serve the public interest.”<sup>13</sup> And as Chairman Pai has observed, section 7 is a particularly important tool to unleash spectrum bands for next-generation services.<sup>14</sup>

RADWIN has amply satisfied the Commission’s proposed framework for expedited treatment under Section 7. The phased-array antenna technology described in the Petition is technically feasible, commercially viable, widely used by the industry, and at the core of all 5G

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<sup>12</sup> 47 U.S.C. § 157.

<sup>13</sup> *Encouraging the Provision of New Technologies and Services to the Public*, Notice of Proposed Rulemaking, GN Docket No. 18-22, at ¶ 8 (rel. Feb. 23, 2018).

<sup>14</sup> Mike Dano, *FCC’s Pai: We will implement ‘Section 7’ to evaluate any new technology or service, including above 95 GHz*, FierceWireless (Mar. 15, 2017), available at <http://bit.ly/2HEHdoj> (“‘Here’s one example of how the Section 7 process could work,’ Pai said today during his speech in Pittsburgh, which was livestreamed by Carnegie Mellon University’s Software Engineering Institute. ‘As part of our so-called ‘Spectrum Frontiers’ proceeding, we asked questions about allowing novel wireless uses and technologies in frequencies above 95 GHz. Those frequencies haven’t traditionally been used for mobile wireless technologies. But I believe that, instead of having regulators decide which frequencies are useful, we should put spectrum out there as a testbed and leave it to the innovators to figure out how to use it. Applications for experimentation above the 95 GHz band could qualify for Section 7 treatment. And this determination, in turn, could accelerate the deployment of cutting-edge wireless services and other innovations.’”).

technologies, which RADWIN has further substantiated through the results of experimental testing, technical analysis, and research. The Commission has previously authorized higher-power phased-array antennas for outdoor use in the 2.4 GHz Band. And RADWIN has met the threshold burden of showing that using smart-antenna technology in the 5 GHz Band will promote innovation and investment, provide new competitive choices to the public, and meet public demand for new or significantly improved services in unserved and underserved areas.

Potential technical concerns should not delay the Commission from moving promptly to seek comment on the costs and benefits of Radwin's proposal. Initiating a rulemaking proceeding does not mean approval of the Petition's request, but rather the start of a process of exploration of the technical risks and benefits of the proposal to arrive at a result that supports more intensive use of the available radiofrequency resources in ways that allow efficient utilization of the 5 GHz Band and benefit all users of the spectrum. To the extent the Commission has questions about the possibility of introducing harmful interference in the 5 GHz Band, it can and should solicit additional technical data from commenters and study from the Office of Engineering and Technology ("OET"). In particular, OET can determine whether there are any material differences between the 2.4 GHz and 5 GHz bands that would require different parameters governing the use of outdoors smart antennas. The rulemaking process can help inform the need for possible interference-mitigation criteria or other prophylactic measures. While there is much promise in RADWIN's Petition, Facebook strongly supports preserving the fundamental character of the unlicensed bands by continuing to allow non-rivalrous deployments and ensuring coexistence among licensed and unlicensed users.

Notwithstanding the need for further technical study, RADWIN has presented enough technical information to merit the Commission's consideration of higher-power, smart-antenna



technologies in the 5 GHz Band for fixed-services applications in outdoor settings. An expeditious rulemaking proceeding is the proper venue to resolve any possible concerns about the details of RADWIN's request.

#### **IV. CONCLUSION.**

RADWIN's Petition potentially promises numerous benefits to the public. By alleviating unnecessary transmit-antenna deployment, smart antennas foster innovation, allow for more efficient use of unlicensed bands, reduce congestion in the 5 GHz Band, and enable wireless providers to reach rural areas on a more cost-effective basis. More efficient and intensive use of the 5 GHz Band, meanwhile, helps deal with the growing need for unlicensed spectrum and oversaturation of the 2.4 GHz Band. Promptly opening a rulemaking proceeding on RADWIN's Petition will ensure that the Commission can identify and address potential harmful interference while discharging its statutory obligation to consider beneficial new technologies as quickly as possible.

Respectfully submitted,

/s/ Alan Norman

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